Com20020 NDIS Miniport Driver Test Report

Team Development Corporation (TDC) had written an NDIS miniport driver for Standard Microsystems Corporation (SMSC) to allow the SMSC Com20020 ARCNET chip to participate in Microsoft Windows networking. Due to requests by SMSC and Contemporary Controls (CCSI), several versions of this driver had been created. One version was created for the CCSI PCM20. The PCM20 is a PCMCIA Com20020 based device.

On February 23, 1998 TDC began modifying the version 4.5 Beta drivers to address several CCSI customer problems. On May 11, 1998 TDC delivered the modified ISA and PCMCIA drivers to CCSI. These new drivers were indicated with an appended version number CCSI 1.1. Enclosed with the drivers was a test report furnished by TDC which addressed the specific issues targeted by the modifications.

The version 1.1 driver was created to address several issues. One of these issues was the incorrect reading of the node numbers specified in the Control Panel Network Properties screen. Another issue was the exception caused by the removal of the PCMCIA card while Windows was active. The interrupts available to the ISA and PCMCIA versions were also increased to provide all standard interrupts. The problem with the driver sporadically hanging was also addressed. Also, all ARCNET packet sizes are now correctly handled.

As the new version driver was tested by TDC in the modified areas, it was felt that a more general test would be needed to determine the current ability of this driver to work together with Microsoft NDIS. The NDIS (Network Driver Interface Specification) provides the means to allow a network interface card (NIC) access to Microsoft networking. A miniport driver provides the simplest means for the NIC device to communicate with NDIS. The miniport NIC driver merely sends out packets requested by NDIS, through it's NIC, and provides NDIS with received network packets. The NDIS model also provides the means to have several protocols communicate over the NIC's network. Some of the more popular protocols include TCP/IP, IPX/SPX and NetBEUI. The NDIS functionality is provided in Windows through the NDIS library or DLL. The various versions of Windows also contain specific versions of the NDIS library. Windows NT 3.51, Windows 95 and Windows 95A contain the NDIS 3.1 library. Windows 95A was the second version of Windows 95 released by Microsoft. The NDIS 4.0 library is provided in Windows NT 4.0 and a later release of Windows 95 called Windows 95 OEM Service Release 2 (OSR2) or Windows 95B. Windows 95B is only available with the purchase of a new computer. As each version of NDIS was released, small changes to the Com20020 miniport driver were necessary in order to stay compatible. The NDIS 5.0 library is available with Windows 98 and most likely with NT 5.0. No testing has been done with Windows 98 or the beta release of NT 5.0.

In order to fully assess the current state of the driver it was felt that an application which allowed the testing of the driver with various protocols would be needed. The Winsock API allows a program to send and receive messages through NDIS and the desired miniport NIC driver. The original Winsock version works very well with TCP/IP but provided little means to communicate with other protocols. The Winsock 2 API allows several protocols to be used during communication. Microsoft provides source code for an application called WSOCK. This application allows two computers to send and receive short messages over the Winsock API. This application formed the basis of the test program used to evaluate the ability of the Com20020 miniport driver to communicate using various protocols. The WSOCK application was modified to allow communications with TCP/IP, IPX/SPX and NetBEUI. It was also modified to allow one computer to echo all received messages back to the originating computer. The originating computer then would send messages of a random size, containing random data, to the echo node. The originating computer would then compare the received echo message against the previously transmitted message. If both messages were identical then the test would continue.

The minimum message size chosen was 100 bytes and the maximum message size was set at 30,000 bytes. The program was also written to send/receive only connection oriented messages. Therefore the message types used were TCP, SPX and NetBEUI sequenced packets.

The testing was conducted with between two desktop computers which had the ability to run various operating systems. One computer, a Compudyne Pentium 133MHz machine, used both a CCSI PCX20 and a CCSI PCM20 during the testing to validate both devices. The PCX20 is an ISA Com20020 based network card. The PCM20 is a PCMCIA Com20020 based network card. The other computer, a clone 80486-DX2 66MHz machine used a CCSI PCX20. The Compudyne computer also had a LINQnet PCI Ethernet installed. The clone machine also had an Acer ISA PnP Ethernet card installed. During initial testing it was found that the Windows 95A TCP/IP system code was different than that used with Windows 95B, or NT 4.0 so the testing of this operating system was excluded. The system code is one byte in the packet used to identify the protocol used. Refer to ATA/ANSI 878.1 for further information. The testing then centered on Windows 95B and NT 4.0. As these operating systems both utilize NDIS 4.0 drivers, only the NDIS 4.0 driver was used during the testing. Both computers also had the NT 4.0 Service pack 3 (SP3) loaded.

Even though one program was used with several protocols, each of the protocols used had its own constraints. For the TCP/IP protocol, the TCP Messages were between 100 to 30,000 bytes in length. The test was completed after 5000 messages were successfully transmitted and received. For the IPX/SPX (or NWLink) protocol, the NT 4.0 SPX messages were 100 to 30,000 bytes in length. In Windows NT the IPX/SPX test was completed after 5000 messages were successfully transmitted and received. In Windows 95B the SPX messages were limited to 450 bytes. The Windows 95 IPX/SPX test was completed after 50,000 messages were successfully transmitted and received. The same test was run with two Ethernet cards under Windows 95B and successful operation was limited to messages from 100 to 500 bytes in length. The NetBEUI (Nbf) protocol did not work under Windows 95 with an NDIS 4.0 ARCNET NIC miniport driver. Therefore all NetBEUI testing was conducted under Windows NT. Also, in order to achieve reliable communications using the NetBEUI protocol, the current NDIS.SYS library, included with Windows, had to be replaced by a newer version (see Microsoft Knowledge Base article Q186150). Also the messages were limited in size to 200 bytes for Nbf-Seqpacket messages (connected NetBIOS Frames protocol). The test was completed after 500,000 messages were successfully transmitted and received. The same test was run with two Ethernet cards under NT 4.0 and it was able to reliably communicate using message lengths from 100 to 30,000 bytes.The testing also examined the ability to communicate from Windows 95B to NT 4.0 as well as between 95B to 95B and NT 4.0 to NT 4.0, using the Com20020 miniport driver.

Results:
The table below shows the results of the test. The various operating systems used during the test are shown in the headings and the protocols correctly used during that combination are shown in the table.

	95B	**NT4**
95B	TCP/IP **OK** IPX/SPX **OK**	TCP/IP **OK** IPX/SPX **OK**
NT4	TCP/IP **OK** IPX/SPX **OK**	TCP/IP **OK** IPX/SPX **OK** NetBEUI **OK**

Conclusion:
This testing covers only a small portion of what could be done to fully validate the driver. Some of the other areas that could be tested would be the use of non-connection oriented messages such as UDP and IPX. Also the driver could be tested in a (multihomed) dual network card system. The combinations being ARCNET/Ethernet, ARCNET/Token Ring and dual ARCNET.

The testing performed did show that TCP/IP, using TCP messaging, to be a reliable protocol using ARCNET under Windows 95 and NT. Also IPX/SPX, using SPX messaging, appears to be a reliable protocol under NT.

One area of concern is in IPX/SPX and the Com20020 driver under Windows 95 where there was a 450 byte message size limit. This test was repeated with an Ethernet card and a similar limitation was found so this may just be a Winsock 2 issue. Another area of concern is in NetBEUI under NT. As the Ethernet test showed, Winsock 2 and NT were able to handle messages as large as 30,000 bytes in length whereas with ARCNET the limit was 200 bytes. This is either a problem with the driver or Microsoft's handling of an ARCNET miniport driver. This is an issue that Microsoft or TDC will need to address.

Use of the NDIS 3.1 miniport driver and TCP/IP under Windows 95 and Windows 95A is discouraged due to cross platform incompatibilities. However, restricting communications between like machines is possible using TCP/IP.

Although untested, CCSI's PC10420 Com20020 based products will provide similar results as they are identical in design to the PCX20 series of products.

Other tests were also run using this driver that were not as formal as those described. The Network Neighborhood program was used reliably with the TCP/IP protocol. An NT machine was successfully networked to a Windows for Workgroups computer and verified using the Network Neighborhood program. The Windows for Workgroups machine used a 90C65 based card and an ODI driver. Also an NT 4.0 machine using a PCX20 and a PCM20 was successfully logged into a Novell 3.12 server using this version of the driver. Two multihomed NT 4.0 systems were setup with one ARCNET card and one Ethernet in each machine. These machines were able to send/receive SPX and TCP messages on both networks concurrently in a reliable manner.

All questions regarding the source code for this driver should be forwarded to Fred Weber of SMSC (fred.weber@smsc.com). The compiled Com20020 miniport drivers (version 1.1) can be obtained from CCSI (blevine@ccontrol.com).